



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 29

[Docket No. FAA-2022-0183; Special Conditions No. 29-056-SC]

Special Conditions: The Boeing Company, Leonardo S.p.a. Model AW139

Helicopter; Use of New Hovering Out of Ground Effect Utility Power on the Model AW139 Helicopter

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Leonardo S.p.a. (Leonardo) Model AW139 helicopter. This helicopter as modified by The Boeing Company (Boeing) will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for helicopters. This design feature incorporates a 2.5-minute all engines operating (AEO) power restricted for use at helicopter operating speeds below 60 knots indicated airspeed (KIAS), and hovering out of ground effect (HOGE). This power is referred to as 2.5-minute HOGE utility power (HUP), or 2.5-minute HUP. The 2.5-minute HUP is greater than the transmission power limitations associated with takeoff and AEO. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: Effective [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

FOR FURTHER INFORMATION CONTACT: Dorina Mihail, Propulsion and Energy Section, AIR-624, Technical Innovation Policy Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 1200 District Avenue, Burlington, MA 01803; telephone 781-238-7153; fax 781-238-7199; e-mail Dorina.Mihail@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On September 18, 2020, Boeing applied for a supplemental type certificate for performance envelope expansion of the Leonardo Model AW139 helicopter. The AW139 helicopter as changed, is a medium twin-engine 14 CFR part 29 transport category B helicopter with a 15,521 pounds (7040 Kg) maximum takeoff weight and a maximum seating capacity of nine passengers and two crew. This helicopter takeoff and landing altitude is 10,000 feet density altitude (Hd), and the forward flight altitude is 11,000 feet Hd. This helicopter has the capability for Category II instrument landing system (ILS) approaches. The Model AW139 helicopter as changed will be equipped with two PT6C-67C1 engines. The Model AW139 helicopter as changed will have a 2.5-minute HUP for use in HOGE that exceeds the transmission power limitations associated with takeoff and AEO.

Type Certification Basis

Under the provisions of 14 CFR 21.101, Boeing must show that the Leonardo Model AW139 helicopter, as changed, continues to meet the applicable provisions of the regulations listed in Type Certificate No. R00002RD, or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA. The proposed certification basis for this supplemental type certificate is as follows:

14 CFR 21.29 and Part 29, Amendment 29-1 through Amendment 29-45 with 14 CFR 29.25, 29.143, 29.173, 29.175, 29.177 at Amendment 29-51, and 14 CFR 29.773 at Amendment 29-57.

Equivalent Level of Safety Findings issued against:

14 CFR 29.1305, as documented in the AB139 FAA Memo, dated December 20, 2004.

If the Administrator finds that the applicable airworthiness regulations (e.g., 14 CFR part 29) do not contain adequate or appropriate safety standards for the Leonardo Model AW139 helicopter because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Leonardo Model AW139 helicopter must comply with the noise certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Feature

The Leonardo Model AW139 helicopter will incorporate a novel or unusual design feature, which is a 2.5-minute AEO power that is greater than the transmission takeoff power limitations associated with takeoff and AEO. This power is restricted for use when HOGE and at helicopter operating speeds below 60 KIAS. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature.

Discussion

The design feature will incorporate a 2.5-minute HUP that allows the pilot to enter HOGE, operate in HOGE, and depart from HOGE at high altitudes and ambient atmospheric temperatures. The use of the 2.5-minute HUP is limited to periods of no longer than 2.5 minutes each use, under AEO conditions, at helicopter operating speeds below 60 KIAS and HOGE. Use of the 2.5-minute HUP is not part of, or combined with a takeoff operation.

Helicopter operation at the 2.5-minute HUP will use the engine power higher than the rated maximum continuous power and limits but lower than the rated takeoff power and limits and does not exceed the 5 minute takeoff rating for which the engines are type certificated. Existing part 33 regulations for the engines are adequate for the helicopter 2.5-minute HUP.

Use of the 2.5-minute HUP exceeds the helicopter transmission power limitations associated with takeoff and AEO. Existing part 29 regulations do not recognize helicopter operation that exceeds the transmission power limitations associated with takeoff and AEO. The special conditions that address the use of the 2.5-minute HUP on this model of helicopter, as modified by Boeing, are as follows.

The Rotorcraft Flight Manual must specify that the use of the 2.5-minute HUP is limited to periods no longer than 2.5 minutes each, under AEO conditions, at helicopter operating speeds below 60 KIAS and HOGE. Additionally, the Rotorcraft Flight Manual must specify that use of the 2.5-minute HUP is not part of, or combined with, a takeoff operation.

The requirement added to § 29.49(c) provides for the development of helicopter performance data for 2.5-minute HUP utilization.

The testing requirement added to § 29.923(d) consists of two applications of 2.5-minute HUP torque and the maximum speed per 10-hour cycle. The 10-hour cycle

represents a run of 10 hours in length that is repeated 20 times, for a total of (at least) 200 hours of endurance testing as required by § 29.923(a). Therefore, the testing added to § 29.923(d) provides for 40 applications of the 2.5-minute HUP during the 200-hour endurance test specified in § 29.923(a). This testing is added to § 29.923(d) “Endurance tests; 90 percent of maximum continuous run,” since the 2.5-minute HUP is not part of, or combined with, a takeoff operation, as stated in these special conditions and is expected to be used during mid-mission.

The flight-test requirement added to § 29.1049 is intended to address the hovering cooling provisions at the 2.5-minute HUP and HOGE following thermal stabilization at maximum weight, mission representative power, maximum altitude, and ambient temperatures specified in § 29.1043(b). The flight-test continues with cycling in and out of the HUP mode, in a manner representative of the intended use of the 2.5-minute HUP, per the instructions specified in the Rotorcraft Flight Manual. The repeated successive HUP applications and time duration between HUP cycles result in the most critical condition for the cooling provisions required by § 29.1041(a) and § 29.1041(b). The flight-test continues with departing the hover and transitioning to a maximum continuous power climb at the best rate of climb speed. Climb is continued for 5 minutes after the highest temperatures are observed or until the service ceiling is reached.

The requirements added to § 29.1305 are means for the pilot to identify when the 2.5-minute HUP level is achieved, when the event begins, and when the time interval expires. These means will assist the pilot in managing the 2.5-minute HUP short time duration in a pilot high-workload environment.

The requirements added to § 29.1521 are similar to the powerplant limitations for takeoff operations in § 29.1521(b), modified to reflect the 2.5-minute HUP.

The requirement added to § 29.1587(b)(8) will require publishing the performance data developed under paragraph (b) of these special conditions in the

Rotorcraft Flight Manual. These data must be clearly referenced to the appropriate hover charts and specify that they are not to be used for take-off or landing determinations.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Discussion of Comments

The FAA issued Notice of Proposed Special Conditions No. 29-22-01-SC for the Leonardo Model AW139 helicopter, which was published in the *Federal Register* on May 3, 2022 (87 FR 26143). The FAA did not receive any comments.

Applicability

As discussed above, these special conditions are applicable to the Leonardo Model AW139 helicopter. Should Boeing apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. R00002RD, to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on the Leonardo Model AW139 helicopter. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of this feature on the helicopter.

List of Subjects in 14 CFR Part 29

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Authority Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701-44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Leonardo S.p.a. Model AW139 helicopter, as modified by The Boeing Company.

(a) The Rotorcraft Flight Manual must state the following:

(1) Use of the 2.5-minute Hovering Out of Ground Effect (HOGE) Utility Power (2.5-minute HUP) is limited to a period no longer than 2.5 minutes each, under all engine operating (AEO) conditions, at helicopter operating speeds below 60 knots indicated airspeed (KIAS) and HOGE.

(2) Use of the 2.5-minute HUP is not part of, or combined with, a takeoff operation.

(b) In addition to the requirements of § 29.49(c), the out-of-ground effect hover performance must be determined over the ranges of weight, altitude, and temperatures for which certification is requested with the 2.5-minute HUP.

(c) In addition to the requirements of § 29.923(d) when performing the endurance test, the 2.5 minute all engines operating must be performed using two applications of 2.5-minute HUP torque and the maximum speed for use with 2.5-minute HUP torque, per 10-hour cycle.

(d) In addition to the requirements of § 29.1049, the hovering cooling provisions at the 2.5-minute HUP must be shown as follows—

(1) Conduct a thermal stabilization at maximum weight, mission representative power, maximum altitude, and ambient temperatures specified in § 29.1043(b); following stabilization, increase power to the 2.5-minute HUP and HOGE for a duration of 2.5 minutes (150 seconds).

(2) Cycle in and out the HUP mode in a manner representative of the intended use of the 2.5-minute HUP, and per the instructions specified in the Rotorcraft Flight

Manual, if any. The HUP cycles should account for repeated successive HUP applications and time duration between HUP cycles resulting in the most critical condition for the cooling provisions required by § 29.1041(a) and § 29.1041(b).

(3) Following the tests in paragraphs (d)(1) and (d)(2) of these special conditions, depart the hover and transition to a maximum continuous power climb at the best rate of climb speed. Continue the climb until 5 minutes after the highest temperatures are observed or until the service ceiling is reached.

(e) In addition to the requirements of § 29.1305, the pilot must have the means to identify the 2.5-minute HUP time limit associated with its use as follows—

- (1) When the power level is achieved,
- (2) when the event begins, and
- (3) when the time interval expires.

These indications must be clear and unambiguous to the pilot and must not cause pilot confusion. The use of these indications must be evaluated in operationally relevant scenarios in accordance with § 29.1523 for crew workload.

(f) In addition to the requirements of § 29.1521, the use of the 2.5-minute HUP must be limited by the following:

- (1) The maximum rotational speed, which may not be greater than—
 - (i) The maximum value determined by the rotor design; or
 - (ii) The maximum value demonstrated during the type tests;
- (2) The maximum allowable turbine inlet or turbine outlet gas temperature (for turbine engines);
- (3) The maximum allowable power or torque for each engine, considering the power input limitations of the transmission with all engines operating;
- (4) The maximum allowable power or torque for each engine considering the power input limitations of the transmission with one engine inoperative;

(5) The time limit for the use of the power corresponding to the limitations established in paragraphs (f)(1) through (f)(4) of these special conditions; and

(6) The maximum allowable engine and transmission oil temperatures, if the time limit established in paragraph (f)(5) of these special conditions exceeds 2 minutes.

(7) Use of 2.5-minute HUP is limited to HOGE only.

(g) In addition to the requirements of § 29.1587(b)(8), the Rotorcraft Flight Manual must contain the out-of-ground effect hover performance determined under paragraph (b) of these special conditions, and the maximum safe wind demonstrated under the ambient conditions for the data presented. In addition, the Rotorcraft Flight Manual must include the maximum weight for each altitude and temperature condition at which the rotorcraft can safely hover out-of-ground-effect in winds not less than 17 knots from all azimuths. These data must be clearly referenced to the appropriate hover charts and specify that they are not to be used for take-off or landing determinations.

Issued in Kansas City, Missouri, on August 25, 2022.

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[FR Doc. 2022-18722 Filed: 8/29/2022 8:45 am; Publication Date: 8/30/2022]